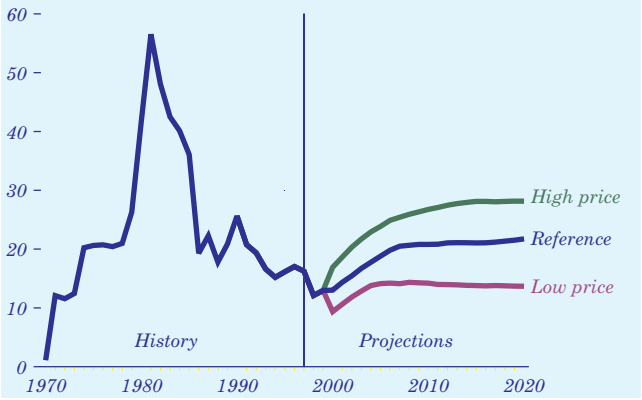
Petroleum Use Grows, But Projected Prices Show Only Modest Increases

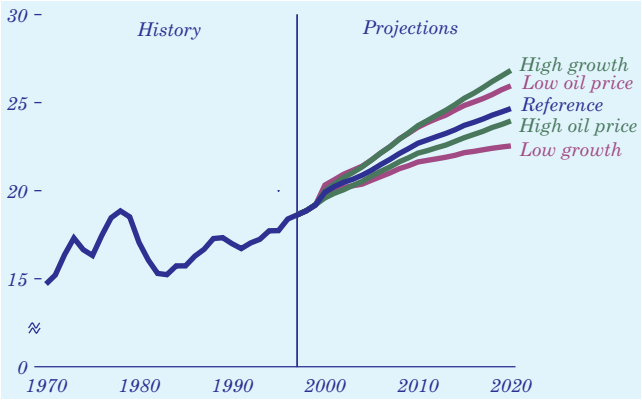
Figure 84. Lower 48 crude oil wellhead prices, 1970-2020 (1997 dollars per barrel)



Because domestic prices for crude oil are determined largely by the international market, the current decline in world oil prices causes wellhead prices for crude oil in the lower 48 States to drop considerably in 1998 in all cases, followed by an increase through the rest of the forecast, regaining 1997 levels in 2003 in the reference case. Wellhead prices are projected to fall by 0.7 percent a year from 1997 to 2020 in the low world oil price case, and to grow by 1.3 and 2.4 percent a year in the reference and high price cases, respectively (Figure 84).

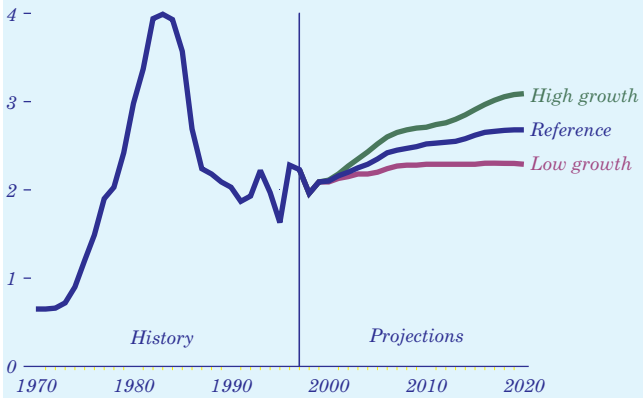
U.S. petroleum consumption continues to rise in all the *AEO99* cases (Figure 85). Total petroleum product supplied ranges from 22.5 million barrels per day in the low economic growth case to 26.8 million in the high growth case, as compared with 18.6 million in 1997.

Figure 85. U.S. petroleum consumption in five cases, 1970-2020 (million barrels per day)



Growing Demand Leads to Rising Natural Gas Prices

Figure 86. Lower 48 natural gas wellhead prices, 1970-2020 (1997 dollars per thousand cubic feet)



Wellhead prices for natural gas in the lower 48 States increase by 0.1, 0.8, and 1.4 percent a year in the low economic growth, reference, and high economic growth cases, respectively (Figure 86). The increases reflect rising demand for natural gas and its impact on the natural progression of the discovery process from larger and more profitable fields to smaller, less economical ones. Price increases also reflect more production from higher cost sources, such as unconventional gas recovery. Lower 48 unconventional gas production grows by 2.7 percent a year in the reference case, compared with 2.2-percent annual growth for conventional sources. Although the sources of production change, technically recoverable resources (Table 6) remain more than adequate overall to meet the production increases.

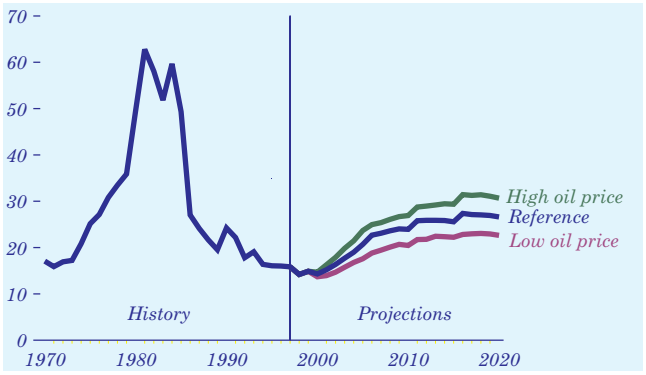
Demand for natural gas rises in all three cases. In the low economic growth case, the increase is gradual, and the price increases attributable to the rising demand are nearly overshadowed by the beneficial impacts of technological progress on the discovery process. In the reference and high growth cases, however, the impacts of technological progress only moderate the resulting price increases.

Table 6. Technically recoverable U.S. oil and gas resources as of January 1, 1997

Total U.S. resources	Crude oil (billion barrels)	Natural gas (trillion cubic feet)
Proved	*23*	*166*
Unproved	*87*	*1,009*
Total	***110***	***1,176***

Increased Drilling Activity Is Expected in the *AEO99* Projections

Figure 87. Successful new lower 48 natural gas and oil wells in three cases, 1970-2020 (thousand successful wells)



Both exploratory and developmental drilling increase in the forecast. With rising prices and declining drilling costs, crude oil and natural gas well completions increase on average by 1.7 and 3.1 percent a year in the low and high oil price cases, respectively, compared with 2.4 percent in the reference case (Figure 87). Changes in world oil price assumptions have a more pronounced effect on projected oil drilling than on gas drilling (Table 7).

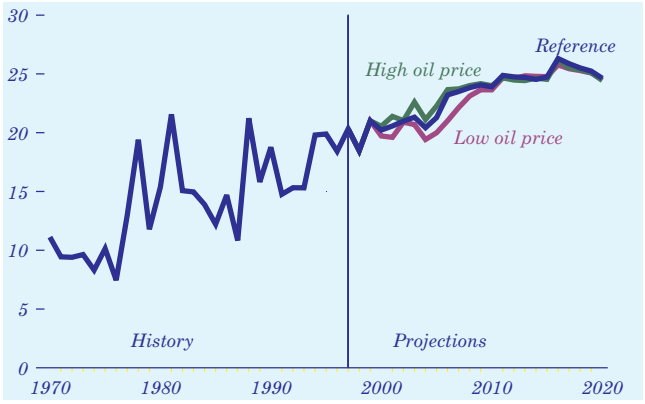
The productivity of natural gas drilling does not decline as much as that of oil drilling, in part because total recoverable gas resources are more abundant than oil resources. At the projected production levels, however, recoverable resources of conventional natural gas decline rapidly in some areas, particularly in the onshore Southwest and offshore Gulf of Mexico regions. In the final analysis, the future overall productivity of both oil and gas drilling is necessarily uncertain, given the uncertainty associated with such factors as the extent of the Nation's oil and gas resources [*62*].

Table 7. Natural gas and crude oil drilling in three cases, 1997-2020 (thousands of successful wells)

	1997	2000	2010	2020
Natural gas				
Low oil price case		*6.6*	*10.9*	*12.0*
Reference case	*8.0*	*6.9*	*11.2*	*12.2*
High oil price case		*7.2*	*11.3*	*12.2*
Crude oil				
Low oil price case		*7.1*	*9.5*	*10.7*
Reference case	*7.8*	*7.4*	*12.7*	*14.4*
High oil price case		*7.5*	*15.4*	*18.5*

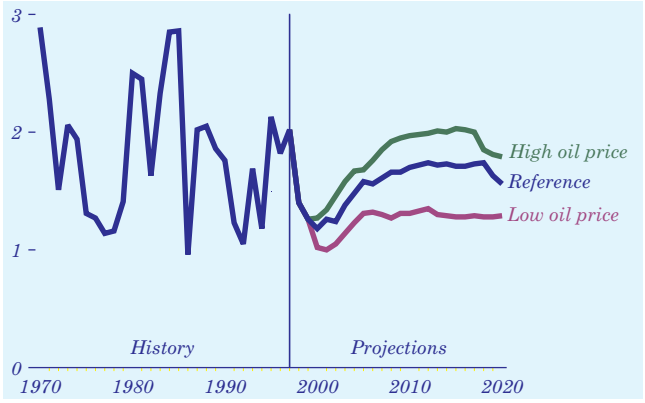
Oil Production Is Projected To Exceed Reserve Additions

Figure 88. Lower 48 natural gas reserve additions in three cases, 1970-2020 (trillion cubic feet)



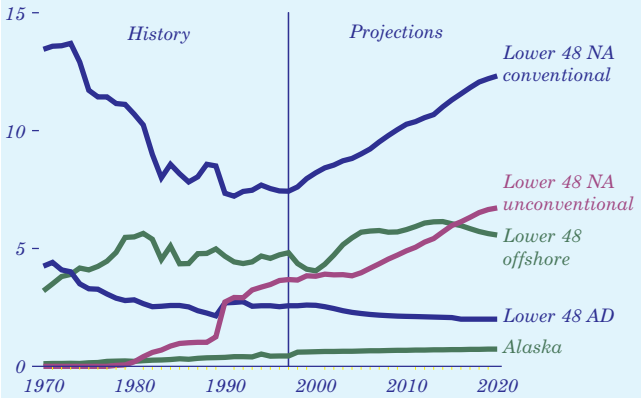
For most of the past two decades, lower 48 production of both oil and natural gas has exceeded reserve additions. The recent reversal of that pattern for natural gas is projected to continue through 2013, even with expected increases in demand, primarily for electricity generation. The relatively high levels of annual gas reserve additions through 2020 reflect increased drilling as a result of higher prices, as well as productivity gains from technological improvements comparable to those of recent years, affecting both exploration and development (Figure 88). Consequently, almost 60 percent of the lower 48 nonassociated natural gas resources expected to be technically recoverable from conventional sources are projected to be discovered by 2020. In contrast, despite varying patterns of lower 48 oil reserve additions (Figure 89), total lower 48 crude oil production exceeds total reserve additions over the forecast period in all cases.

Figure 89. Lower 48 crude oil reserve additions in three cases, 1970-2020 (billion barrels)



Most Natural Gas Production Is Expected From Conventional Sources

Figure 90. Natural gas production by source, 1970-2020 (trillion cubic feet)



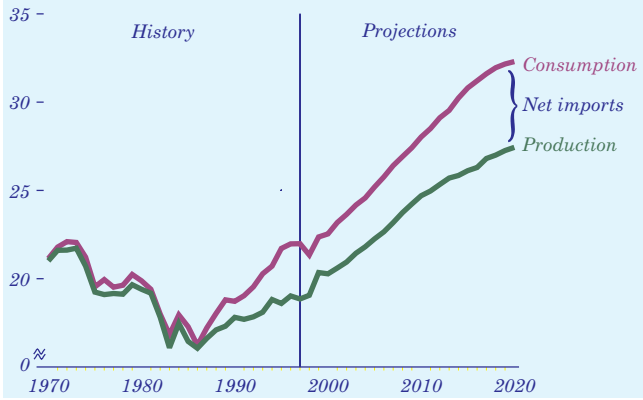
The continuing increase in domestic natural gas production in the forecast comes primarily from lower 48 onshore nonassociated (NA) sources (Figure 90). Conventional onshore production, which accounted for 39.2 percent of total U.S. domestic production in 1997, increases in share to 45.0 percent of the total in 2020. Unconventional sources also increase in share, and gas from offshore wells in the Gulf of Mexico contributes significantly to production. The innovative use of cost-saving technology and the expected mid-term continuation of recent huge finds, particularly in the deep waters of the Gulf of Mexico, support this projection.

Natural gas production from Alaska grows by 2.3 percent a year in the forecast. Currently, all production is either consumed in the State, reinjected, or exported to Japan as liquefied natural gas (LNG). Alaskan gas is not expected to be transported to the lower 48 States, because the projected lower 48 prices are not high enough in the forecast period to support the required transport system. Expected Alaskan natural gas production does not include gas from the North Slope, which primarily is being reinjected to support oil production. In the future, North Slope gas may be marketed as LNG to Pacific Rim markets [*63*].

Production of associated/dissolved (AD) natural gas from lower 48 crude oil reservoirs generally declines, following the expected pattern of domestic crude oil production. AD gas accounts for 7.6 percent of total lower 48 production in 2020, compared with 13.9 percent in 1997.

Net Imports of Natural Gas Are Projected To Increase

Figure 91. Natural gas production, consumption, and imports, 1970-2020 (trillion cubic feet)



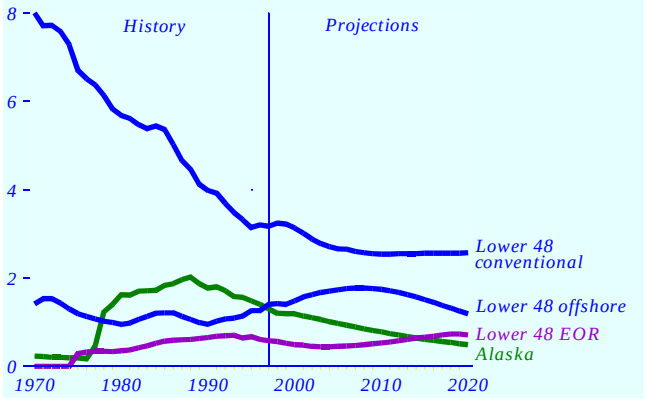
Net natural gas imports are expected to grow in the forecast (Figure 91) from 12.9 percent of total gas consumption in 1997 to 15.5 percent in 2020. Most of the increase is attributable to imports from Canada, which are projected to grow substantially as considerable new pipeline capacity comes on line. While most of the new capacity provides access to supplies from western Canada through the Midwest, new capacity is also expected to provide access to eastern supplies, including gas from Sable Island in the offshore Atlantic [*64*].

Mexico has a considerable natural gas resource base, but there is uncertainty as to whether its indigenous production can be increased sufficiently to satisfy rising demand. Since 1984, U.S. natural gas trade with Mexico has consisted primarily of exports. That trend is expected to continue throughout the forecast, with exports increasing as mandated conversion of power plants from heavy fuel oil to natural gas gains momentum, in compliance with Mexico's new environmental regulations.

LNG provides another source of gas imports; however, given the projected low natural gas prices in the lower 48 markets, LNG is not expected to grow beyond a regionally significant source of U.S. supply. LNG imports into Everett, Massachusetts, and Lake Charles, Louisiana, are projected to increase over the forecast, reaching a level of 0.29 trillion cubic feet in 2020, compared with 0.02 trillion cubic feet in 1997 [*65*].

Natural Gas Use Grows Strongly in All the *AEO99* Cases

Figure 92. Natural gas consumption in five cases, 1970-2020 (trillion cubic feet)

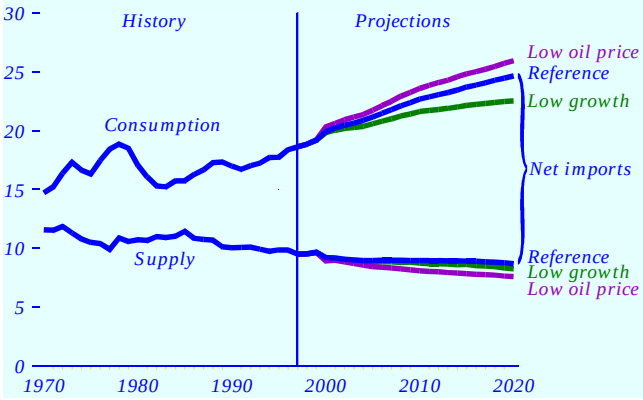


Natural gas consumption increases from 1997 to 2020 in all the *AEO99* cases (Figure 92). Domestic consumption ranges from 29.5 trillion cubic feet per year in the low economic growth case to 34.8 trillion in the high growth case in 2020, as compared with 22.0 trillion cubic feet in 1997. Growth is seen in all end-use sectors, with more than half of the growth resulting from rising demand for electricity, including industrial cogeneration.

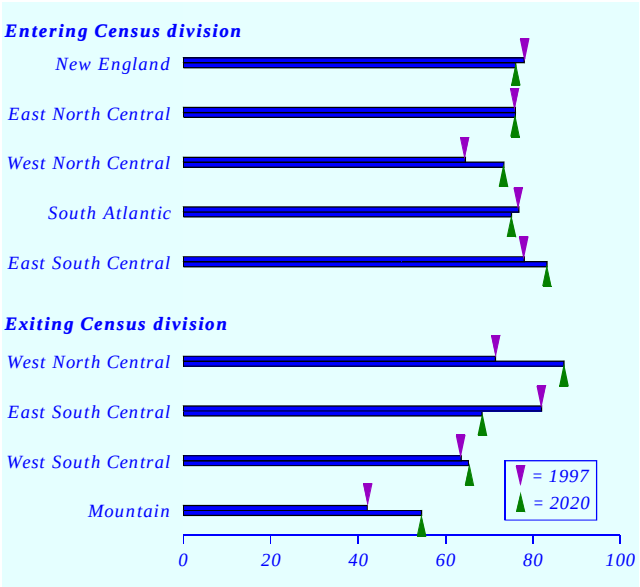
Natural gas consumption in the electricity generation sector (excluding cogeneration) grows steadily throughout the forecast. In the reference case it nearly triples, from 3.3 trillion cubic feet a year in 1997 to 9.2 trillion cubic feet in 2020. Restructuring of the electric utility industry is expected to open up new opportunities for gas-fired generation. In addition, growth is spurred by increased utilization of existing gas-fired power plants in the forecast and the addition of new turbines and combined-cycle facilities, which are less capital-intensive than coal, nuclear, or renewable electricity generation plants. Although projected coal prices to the electricity generation sector fall throughout the forecast, the natural gas share of new capacity is nearly 10 times the coal share. Lower capital costs and projected improvements in gas turbine heat rates make the overall cost of gas-generated electricity per kilowatthour competitive with the cost of electricity from new coal-burning generators.

Rising Gas Demand Is Expected To Prompt Pipeline Expansions

Figure 93. Pipeline capacity expansion by Census division, 1997-2020 (billion cubic feet per day)

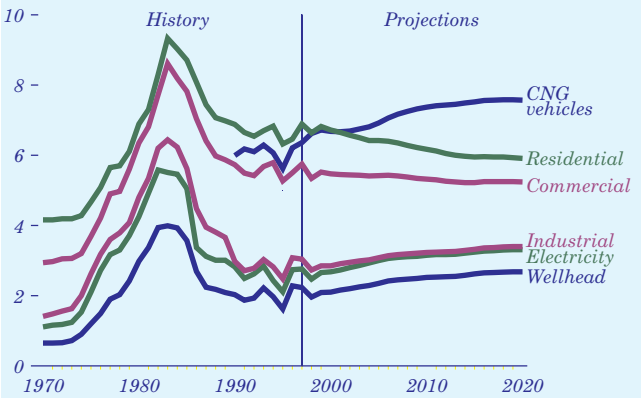


Demand for natural gas is projected to outstrip existing pipeline capacity. Expansion of interstate capacity (Figure 93) will be needed to provide access to new supplies and to serve expanding markets. Expansion is projected to proceed at a rate of 1.2 percent a year through the forecast. The greatest increases are projected along the corridors that move Canadian and Gulf Coast supplies to markets in the eastern half of the United States. Natural gas deliverability is also augmented by new storage capacity which is projected to increase in most regions over the forecast period. In several regions, growth in new pipeline construction is tempered by higher utilization of existing pipeline capacity (Figure 94).



Residential, Commercial Gas Prices Are Projected To Decline

Figure 95. Natural gas end-use prices by sector, 1970-2020 (1997 dollars per thousand cubic feet)



While consumer prices to the industrial, electricity, and transportation sectors generally increase throughout the forecast period, prices to the residential and commercial sectors decline (Figure 95). The decreases reflect declining distribution margins to these sectors due to anticipated efficiency improvements in an increasingly competitive market. In the industrial sector, a modest decrease in margins is overshadowed by an increase in wellhead prices, and the overall trend is a slight rise in prices. In the electricity generation sector, increases in pipeline margins and wellhead prices combine to yield an average 0.8-percent annual rise in end-use prices. The declines in the residential and commercial sectors overshadow the increases in other sectors, yielding a 0.3-percent drop in national average end-use prices.

Compared with their rise and decline over the 1970 1997 period, transmission and distribution revenues in the natural gas industry are relatively stable in the forecast, declining slightly through 2010, when they begin a gradual increase (Table 8). Declines in margins are balanced by higher volumes.

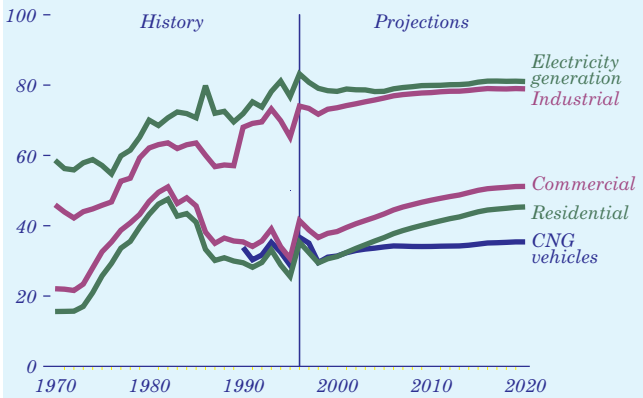
Table 8. Transmission and distribution revenues and margins, 1970-2020

	1970	1985	1997	2010	2015	2020
T&D revenues (billion 1997 dollars)	30.43	49.13	44.39	42.47	42.72	43.31
End-use consumption (trillion cubic feet)	19.02	15.81	20.02	25.49	28.06	29.39
Average margin* (1997 dollars per thousand cubic feet)	1.60	3.11	2.22	1.67	1.53	1.48

*Revenue divided by end-use consumption.

Lower Distribution Costs Are Projected for Natural Gas

Figure 96. Wellhead share of natural gas end-use prices by sector, 1970-2020 (percent)



With distribution margins declining, the wellhead shares of end-use prices generally increase in the forecast (Figure 96). The greatest impact is in the residential and commercial markets, where most customers purchase gas through local distribution companies (LDCs). In the electricity generation sector, which has a relatively stable share, the majority of customers do not purchase from distributors.

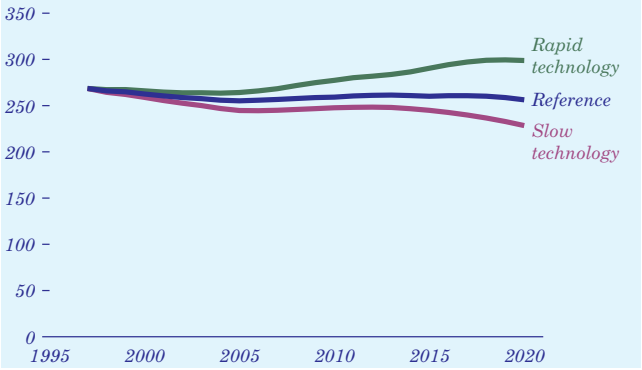
Changes have been seen historically in all components of end-use prices (Table 9). Pipeline margins decreased between 1985 and 1997 with industry restructuring. On average, modest decreases are projected to continue through the forecast period, despite the cost of interstate pipeline expansion. Although LDC margins in the residential and commercial sectors have seen little or no decrease since 1985, efficiency improvements and other impacts of restructuring are exerting downward pressure on distribution costs, and reduced margins are projected for these sectors.

Table 9. Components of residential and commercial natural gas end-use prices, 1985-2020 (1997 dollars per thousand cubic feet)

Price Component	1985	1997	2000	2010	2020
Wellhead price	3.56	2.23	2.10	2.52	2.68
Citygate price	5.32	3.59	3.34	3.66	3.75
Pipeline margin	1.76	1.36	1.24	1.14	1.07
LDC margin					
Residential	3.37	3.41	3.38	2.51	2.16
Commercial	2.49	2.20	2.13	1.66	1.49
End-use price					
Residential	8.69	7.00	6.72	6.17	5.91
Commercial	7.81	5.79	5.47	5.32	5.24

Technology Advances Could Boost Oil and Gas Reserve Additions

Figure 97. Lower 48 crude oil and natural gas end-of-year reserves in three cases, 1997-2020 (quadrillion Btu)



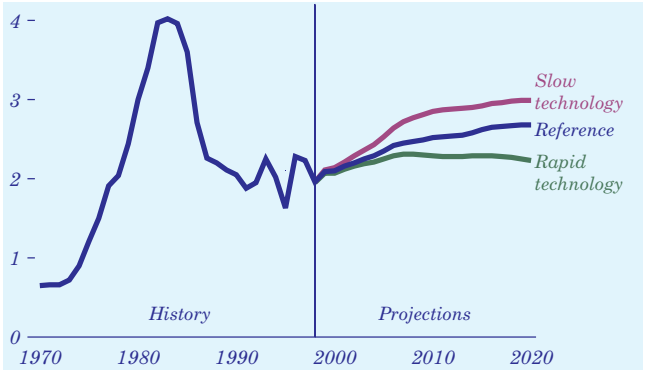
In the forecast, major advances in data acquisition, data processing, and the display and integration of seismic data with other geologic data—combined with lower cost computer power and experience gained with new techniques—continue to put downward pressure on costs while significantly improving finding and success rates. Effective use of improved exploration and production technologies to aid in the discovery and development of resources—particularly, unconventional gas and offshore deepwater fields—will be needed if new reserves are to replace those depleted by production.

Alternative cases were used to assess the sensitivity of the projections to changes in success rates, exploration and development costs, and finding rates as a result of technological progress. The assumed technology improvement rates were increased and decreased by approximately 50 percent in the rapid and slow technology cases, which were run as fully integrated model runs. All other parameters in the model were kept at their reference case values, including technology parameters for other modules, parameters affecting foreign oil supply, and assumptions about foreign natural gas trade.

Although gas reserves become a slightly larger share of the total in the reference case, total hydrocarbon reserve additions offset production, keeping total reserves essentially constant throughout the projection period (Figure 97). By 2020, reserves are 16.6 percent higher in the rapid technology case than in the reference case and 10.9 percent lower in the slow technology case.

Projected Gas Prices Strongly Depend on Technology Assumptions

Figure 98. Lower 48 natural gas wellhead prices in three cases, 1970-2020 (1997 dollars per thousand cubic feet)



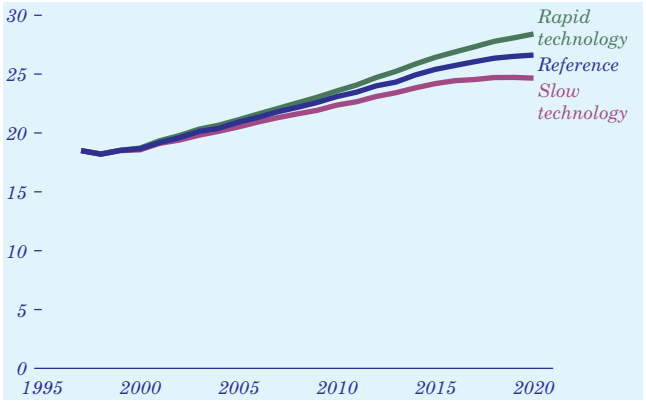
The natural gas price projections are highly sensitive to changes in the assumptions about technological progress (Figure 98). Lower 48 wellhead prices increase at an average annual rate of 1.3 percent in the slow technology case, compared with only 0.8 percent in the reference case, over the projection period. In the rapid technology case, average natural gas wellhead prices are higher than the 1997 level by at most 3.5 percent, and by 2020 they are back to the 1997 price of $2.23 per thousand cubic feet.

Through 2000, both price and production levels for lower 48 oil and natural gas are almost identical in the reference case and the two technological progress cases. By 2020, however, natural gas prices are 11.6 percent higher (at $2.99 per thousand cubic feet) in the slow technology case and 16.8 percent lower (at $2.23 per thousand cubic feet) in the rapid technology case than in the reference case ($2.68 per thousand cubic feet).

Unlike natural gas, lower 48 average wellhead prices for crude oil do not vary significantly across the technology cases. In 2020, crude oil prices are 25 cents lower in the rapid technology case and 6 cents higher in the slow technology case than the reference case price of $21.73 per barrel. Domestic oil prices are determined largely by the international market; changes in U.S. oil production do not constitute a significant volume relative to the global market.

Technology Progress Could Boost Natural Gas Market Share

Figure 99. Lower 48 natural gas production in three cases, 1997-2020 (trillion cubic feet)



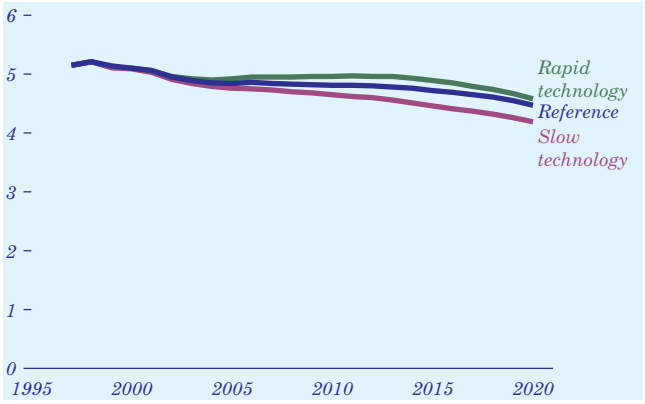
Changes in production in the alternative technology cases reflect the benefits of lower costs and higher finding rates for conventionally recoverable gas, as well as an array of technological enhancements for unconventional gas recovery. The changes in supply lead to price changes that affect new investment in all types of gas-fired technologies, especially in the industrial and electricity generation sectors. Rapid technology improvements yield benefits in the form of both lower prices and increased production to meet higher consumption requirements (Figure 99).

In the rapid technology case, the natural gas share of fossil fuel inputs to electricity generation facilities in 2020 is 24.6 percent, compared with 22.2 percent in the slow technology case. The higher level of gas consumption comes largely at the expense of coal. There is little additional displacement of petroleum products in the rapid technology case, because natural gas captures the bulk of the dual-fired boiler market in the reference case. In contrast, in the slow technology case, natural gas loses market share to both coal and petroleum products in the electricity generation sector.

Production from unconventional gas resources (tight sands, shales, and coalbeds) is particularly responsive to changes in the assumed levels of technological progress. In the rapid technology case, the unconventional gas share of total lower 48 natural gas production in 2020 is projected to be 33.5 percent, compared with 25.2 percent in the reference case and 19.3 percent in the slow technology case.

Oil Production Shows Less Change With Technology Assumptions

Figure 100. Lower 48 crude oil production in three cases, 1997-2020 (million barrels per day)



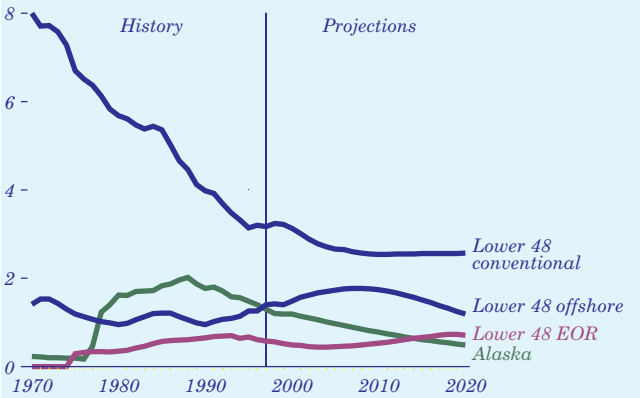
The projections for domestic oil production also are sensitive to changes in the technological progress assumptions (Figure 100). In comparison with the projected lower 48 production level of 4.5 million barrels per day in 2020 in the reference case, oil production increases to 5.2 million barrels per day in the rapid technology case and decreases to 4.6 million in the slow technology case.

Given the assumption that changes in the levels of technology affect only U.S. oil producers, total oil supply adjusts to the variations in technological progress assumptions primarily through changes in imports of crude oil and other petroleum products. Net imports range from a low of 11.7 million barrels per day in the rapid technology case to a high of 12.4 million barrels per day in the slow technology case.

Global trade in natural gas has not grown to the same extent as petroleum trade. Because opportunities for gas trade between the United States and countries outside North America are limited, changes in U.S. gas production are determined more by the market conditions in North America than by the international market.

Continued Decline Is Projected for Conventional Oil Production

Figure 101. Crude oil production by source, 1970-2020 (million barrels per day)



Projected domestic crude oil production continues its historic decline throughout the forecast (Figure 101), declining by 1.1 percent a year, from 6.5 million barrels per day in 1997 to 5.0 million barrels per day in 2020 [*66*]. Conventional onshore production in the lower 48 States, which accounted for 49.1 percent of total U.S. crude oil production in 1997, is also projected to decrease at an average annual rate of 0.9 percent over the forecast.

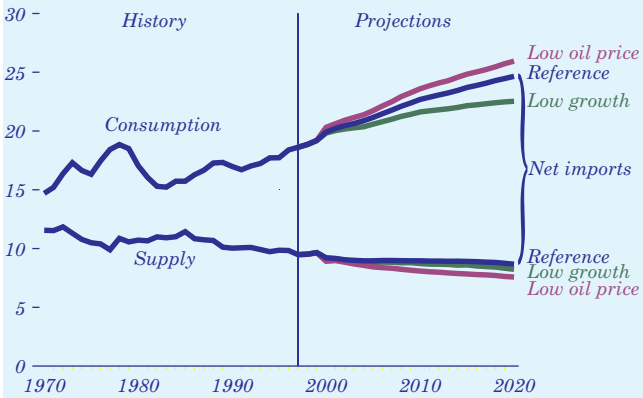
Crude oil production from Alaska is expected to decline at an average annual rate of 4.1 percent between 1997 and 2020. The overall decrease in Alaska's oil production results from a continuing decline in production from most of its oil fields and, in particular, from Prudhoe Bay, the largest producing field, which historically has accounted for more than 60 percent of total Alaskan production.

Offshore production generally increases in the forecast through 2008 and then drops below current levels in 2020, resulting in an overall decrease of 0.7 percent a year. Technological advances and lower costs for deep exploration and production in the Gulf of Mexico contribute to the increase in the early years of the forecast.

Production from enhanced oil recovery (EOR) [*67*], which becomes less profitable as oil prices fall, slows through 2003 and then increases along with world oil prices through the remainder of the forecast.

Declining Domestic Oil Supply Leads to Growing Imports

Figure 102. Petroleum supply, consumption, and imports, 1970-2020 (million barrels per day)



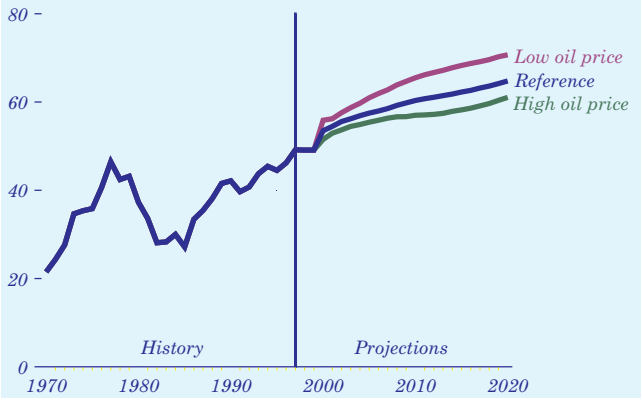
Domestic petroleum supply declines in all the *AEO99* cases (Figure 102), as U.S. crude oil production falls off. In the low price case, domestic supply drops from its 1997 level of 9.4 million barrels per day to 7.6 million barrels per day in 2020. In the high price case, domestic supply declines only slightly, to 9.3 million barrels per day in 2020.

The greatest variation in petroleum consumption levels is seen across the economic growth cases, with an increase of 8.2 million barrels per day over the 1997 level in the high growth case, compared with an increase of only 3.9 million barrels per day in the low growth case.

Additional petroleum imports will be needed to fill the widening gap between supply and consumption. The greatest gap between supply and consumption is seen in the low world oil price case and the smallest in the low economic growth case. The projections for net petroleum imports in 2020 range from a high of 18.4 million barrels per day in the low oil price case—more than double the 1997 level of 9.2 million barrels per day—to a low of 14.3 million barrels per day in the low growth case. The value of petroleum imports in 2020 ranges from $99.7 billion in the low price case to $158.1 billion in the high price case. Total annual U.S. expenditures for petroleum imports, which reached a historical peak of $140 billion (in 1997 dollars) in 1980 [*68*], were $60.9 billion in 1997.

Imports Are Projected To Meet About Two-Thirds of U.S. Oil Demand

Figure 103. Share of U.S. petroleum consumption supplied by net imports, 1970-2020 (percent)



In 1997, net imports of petroleum climbed to a record 49 percent of domestic petroleum consumption. Continued dependence on petroleum imports is projected, reaching 65 percent in 2020 in the reference case (Figure 103). The corresponding import shares of total consumption in 2020 are 61 percent in the high oil price case and 71 percent in the low price case.

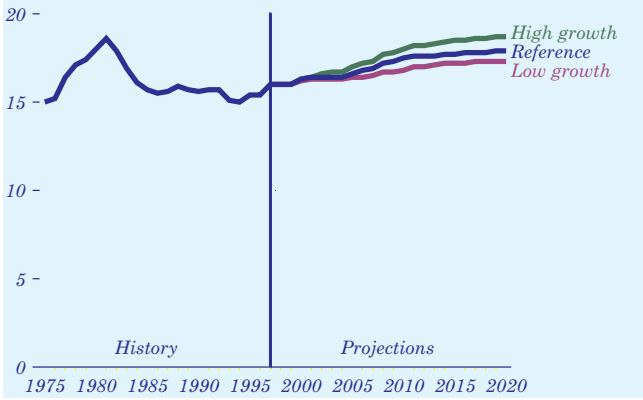
Although crude oil is expected to continue as the major component of petroleum imports, refined products represent a growing share. More imports will be needed as growth in demand for refined products exceeds the expansion of domestic refining capacity. Refined products make up 20 percent of net petroleum imports in 2020 in the low economic growth case and 29 percent in the high growth case, as compared with their 11-percent share in 1997 (Table 10).

Table 10. Petroleum consumption and net imports, 1997 and 2020 (million barrels per day)

Year and projection	Product supplied	Net imports	Net crude imports	Net product imports
1997	18.6	9.2	8.1	1.0
2020				
Reference	24.7	16.0	12.0	4.0
Low oil price	26.0	18.3	13.1	5.2
High oil price	24.0	14.6	11.5	3.1
Low growth	22.5	14.3	11.4	2.9
High growth	26.8	17.7	12.6	5.1

Modest Increases Are Projected for U.S. Refining Capacity

Figure 104. Domestic refining capacity, 1975-2020 (million barrels per day)



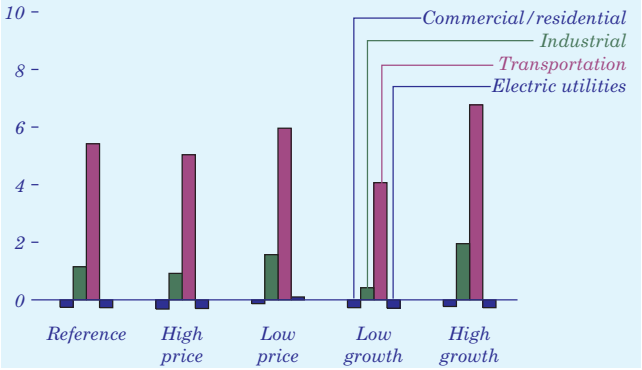
Falling demand for petroleum and the deregulation of the domestic refining industry in the 1980s led to 13 years of decline in U.S. refinery capacity [*69*]. That trend was broken in 1995 by a capacity increase of 0.5 million barrels per day over a 2-year period. Financial and legal considerations make it unlikely that new refineries will be built in the United States, but additions at existing refineries are expected to increase total U.S. refining capacity in all the *AEO99* cases (Figure 104).

Distillation capacity is projected to grow from the 1997 level of 16.0 million barrels per day to 17.3 million in 2020 in the low economic growth case and 18.7 million in the high growth case, as refining capacity exceeds the 1981 peak of 18.6 million barrels per day. Refining capacity is projected to expand on the East, West, and Gulf coasts. Existing refineries will continue to be utilized intensively throughout the forecast, in a range from 93 to 96 percent of design capacity. In comparison, the 1997 utilization rate was 95 percent, well above the rates of the 1980s and early 1990s.

Domestic refineries will produce a slightly higher yield of heating oil and jet fuel in 2020 in response to growing demand for those products. In 2020, heating oil is projected to represent 9 percent of production and jet fuel 13 percent, compared with 7 percent and 9 percent, respectively, in 1997.

More Petroleum Use by Industry and for Transportation Is Projected

Figure 105. Change in petroleum consumption by sector in five cases, 1997-2020 (million barrels per day)



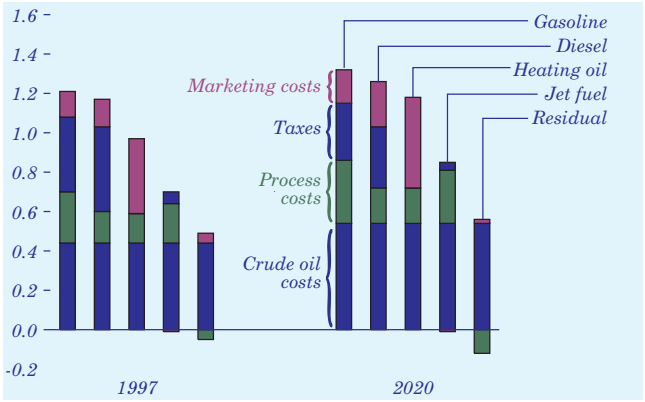
U.S. petroleum consumption is projected to increase by 6.0 million barrels per day between 1997 and 2020 in the reference case, 3.9 million in the low economic growth case, and 8.2 million in the high growth case (Figure 105). All the cases show growth in petroleum consumption in the transportation and industrial sectors and, with the exception of the low world oil price case, slight declines in residential, commercial, and electric utility oil use.

Most of the increase in petroleum consumption occurs in the transportation sector, which accounted for about 65 percent of U.S. petroleum use in 1997. That share grows to 69 percent in the low oil price case and 72 percent in the low economic growth case in 2020. Gasoline accounts for about 45 percent of the projected growth in total petroleum consumption, jet fuel 24 percent, diesel fuel 4 percent, and heating oil 9 percent. All these fuels are "light products," which are more difficult to produce than such heavier products as asphalt and residual fuel oil.

A shift in consumption patterns is expected within the transportation sector. Gasoline, which in 1997 represented 65 percent of the petroleum consumed for transportation, shrinks to a 61-percent share in 2020, as alternative fuels penetrate transportation markets. The jet fuel share rises from 13 percent in 1997 to 17 percent as air travel increases substantially. The share for diesel declines from 18 percent to 14 percent. With the emergence of biomass-based ethanol, the use of ethanol to boost octane or oxygen in gasoline increases from about 80,000 barrels per day in 1997 to 180,000 barrels per day in 2020.

Higher Processing Costs Are Expected for Gasoline and Jet Fuel

Figure 106. Components of refined product costs, 1997 and 2020 (1997 dollars per gallon)



Refined product prices are determined by crude oil costs, refining process costs (including refiner profits), marketing costs, and taxes (Figure 106). In the *AEO99* projections, crude oil costs continue to make the greatest contribution to product prices, and marketing costs remain stable, but the contributions of processing costs and taxes change considerably.

The processing costs for gasoline and jet fuel increase by 6 cents and 7 cents per gallon, respectively, between 1997 and 2020. For the most part, the increases can be attributed to the growth in demand for these products. A small portion of the increases can be attributed to investments related to compliance with refinery emissions, health, and safety regulations, which add 1 to 3 cents per gallon to the processing costs of light products (gasoline, distillate, jet fuel, kerosene, and liquefied petroleum gases).

Whereas processing costs tend to increase refined product prices, assumptions about Federal taxes tend to slow the growth of motor fuels prices. In keeping with the *AEO99* assumption of current laws and legislation, Federal motor fuels taxes are assumed to remain at nominal 1997 levels throughout the forecast. Federal taxes have actually been raised sporadically in the past. State motor fuels taxes are assumed to keep up with inflation, as they have in the past. The net impact of these assumptions is a decrease in Federal taxes between 1997 and 2020—9 cents per gallon for gasoline, 11 cents for diesel fuel, and 2 cents for jet fuel.